(1) Evaluate the following, Simplify your answer to the best possible:
   a) $\log_2\pi(1 + i)$;
   b) $\log(1 + \sqrt{3}i)$.

(2) Solve the equation
    
    \[ e^{4z} + e^{3z} + e^{2z} + e^z + 1 = 0. \]

(3) Determine a branch of $f(z) = \log(z^2 + 2z - 2i)$ that is analytic at $z = i$, and take the value $3\pi i$ there.

(4) Find all values of $(2^i)^i$. 